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Recent radiopurity measurements in HADES

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Detector

Name: Ge-4

Manufacturer: Canberra Semiconductor n.v., Olen

Type: “XtRa” – Extended range

Relative Efficiency: 106%

Crystal configuration: 80 mm long coaxial

Crystal diameter: 80 mm

Window and cryostat from Kryal

Background count rate (40-2700 keV): 450 counts per day and kg (Ge)

46 keV: 1.2 ± 0.4 d^{-1}

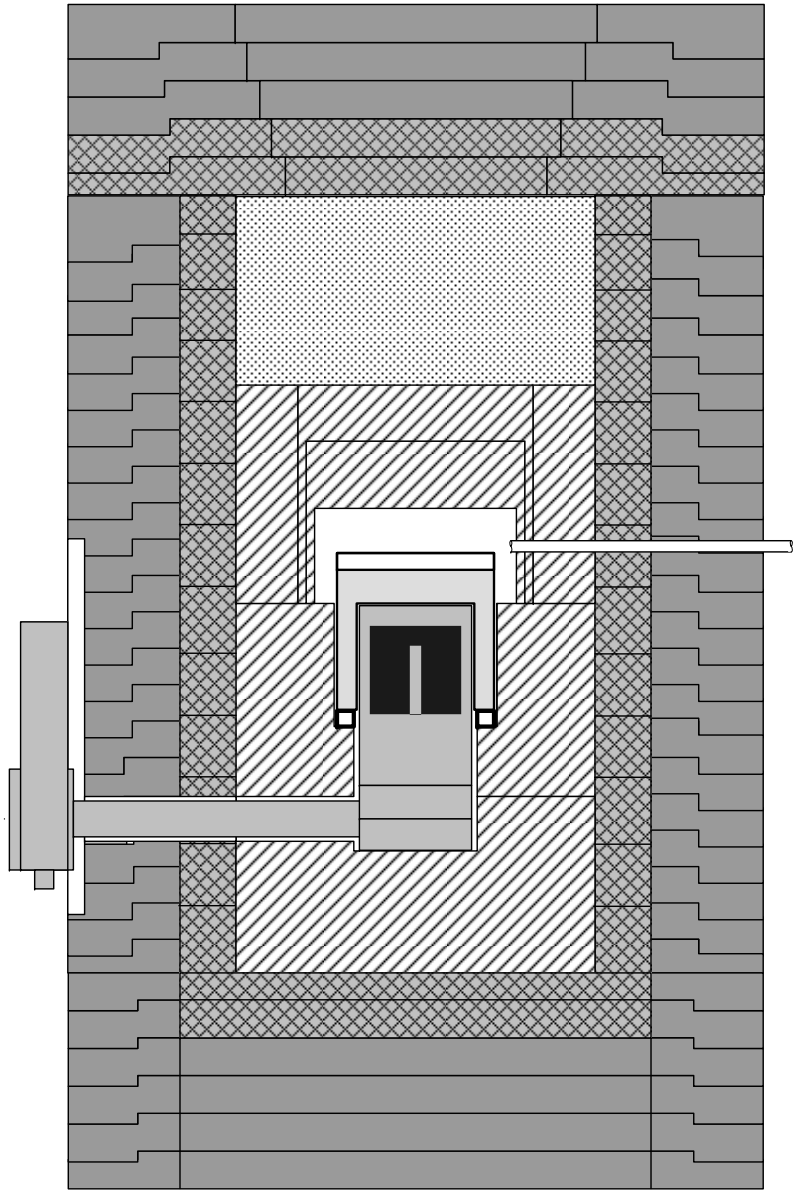
295 keV: 1.0 ± 0.3 d^{-1}

1332 keV: 0.34 ± 0.13 d^{-1}

1460 keV: 3.0 ± 0.3 d^{-1}

2614 keV: 0.8 ± 0.2 d^{-1}

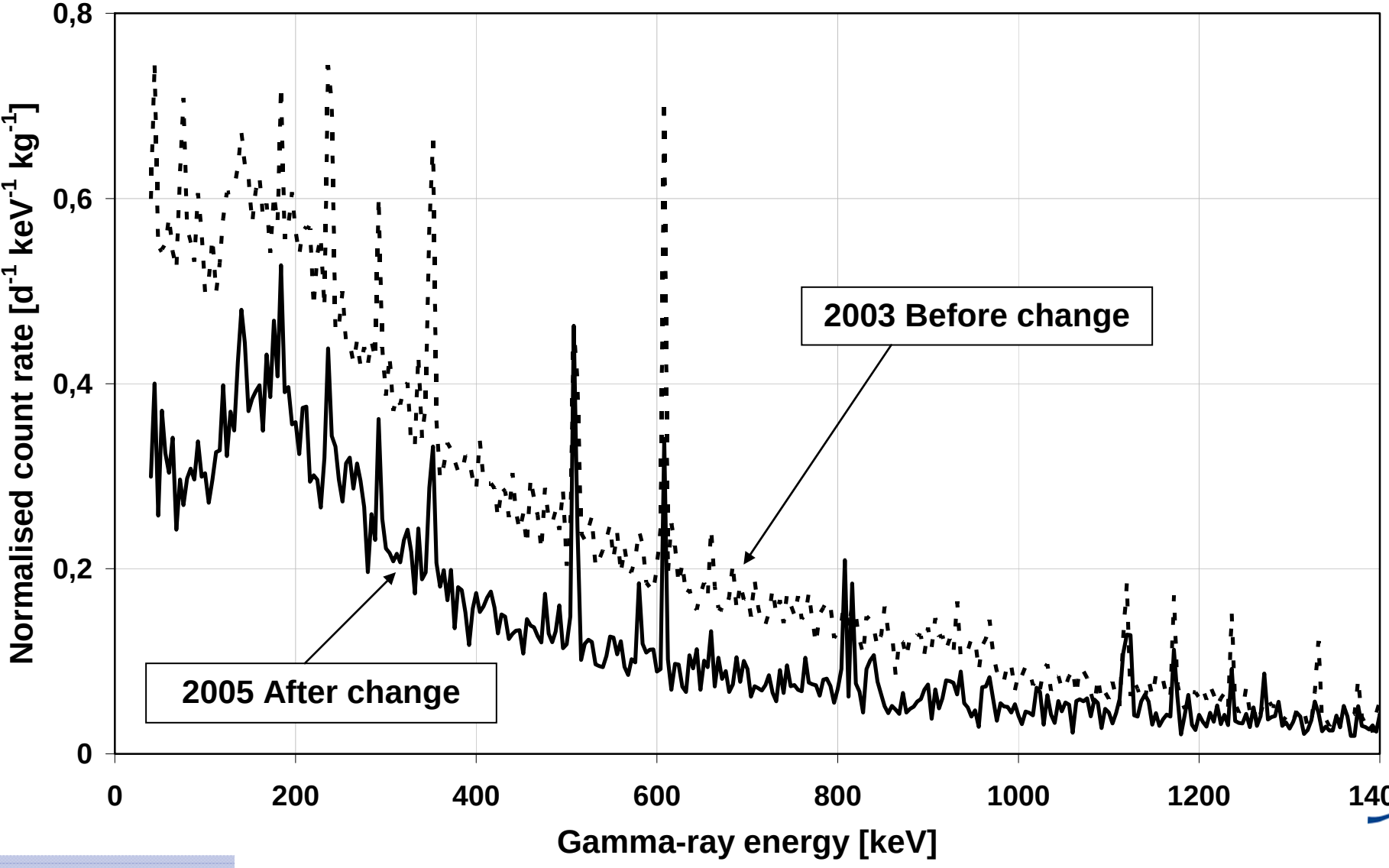
Detector Ge-4



	Copper
	Ge-crystal
	Marinelli
	Perspex
	Lead
	Low activity lead

Ge-4 improvement

Change of carbonepoxy window to a Kryal endcap.



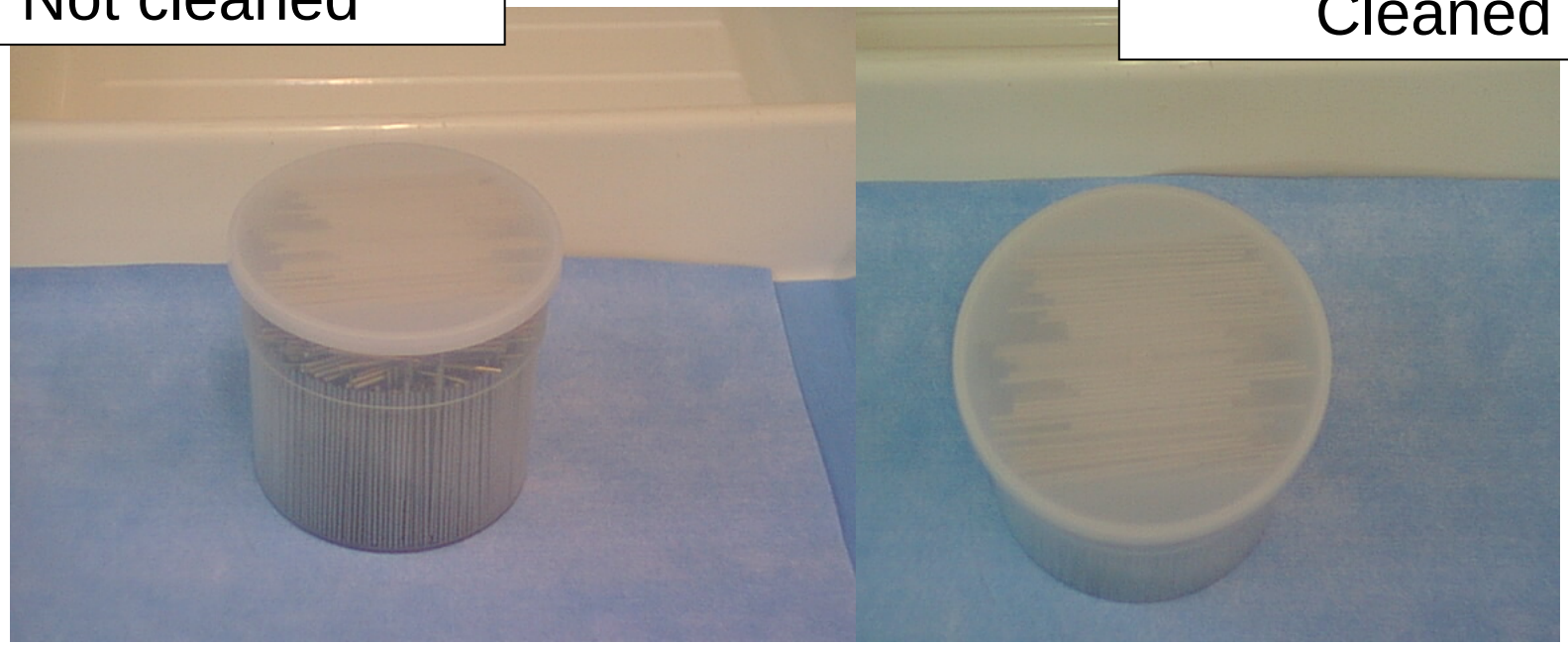
Ge-4 improvement

		Before	After	With Hg
Eγ (keV)	*Radionuclide*	*2003* (counts d^{-1})	*2005* (counts d^{-1})	*2006-Hg* (counts d^{-1})
46	^{210}Pb	1.2 (4)	1.19 (26)	1.1 (3)
186	$^{226}Ra+^{235}U$	1.9 (6)	1.0 (4)	< 0.6
238	^{212}Pb	2.5 (4)	1.02 (28)	1.38 (21)
242	^{214}Pb	1.2 (4)	0.38 (19)	0.41 (16)
295	^{214}Pb	1.9 (4)	1.04 (26)	0.6 (3)
351	^{214}Pb	4.5 (4)	2.05 (28)	1.72 (18)
583	^{208}Tl	0.92 (27)	0.63 (17)	1.10 (19)
609	^{214}Bi	4.4 (4)	2.38 (27)	1.53 (20)
661	^{137}Cs	0.58 (22)	0.29 (17)	< 0.3
911	^{228}Ac	0.29 (21)	0.38 (18)	1.34 (17)
969	^{228}Ac	< 0.5	0.39 (14)	0.61 (12)
1332	^{60}Co	0.69 (11)	0.34 (13)	0.39 (13)
1460	^{40}K	10.5 (4)	3.09 (28)	4.07 (23)
2614	^{208}Tl	0.78 (12)	0.86 (15)	1.76 (15)
40-2700 keV		766 (3)	456 (3)	468.0 (23)
Measuring time		66 days	45 days	88 days

Welding rods

Not cleaned

Cleaned



Sample mass: 3552 g

Sample cleaning (in 3 different batches)

- Ultrasonic bath with Alcinox® for 15 min.
- Rinsing in isopropanol
- Drying in laminar flow
- Placement in the same sample container

Activity before cleaning

Measurement time: 10.7 days

Radionuclide	Massic activity (mBq/kg)	u_c
Co-60	130.9	1.2
K-40	8.5	1.2
Th-228	6.7	0.6
Mn-54	1.9	0.3

Decision threshold (α=0.05)

Cs-137	
Ra-226	
Ra-228	

Activity after cleaning

Measurement time: 9.8 days

Radionuclide	Massic activity (mBq/kg)	u_c
Co-60	130.4	1.2
K-40	1.3	0.3
Th-228	8.6	0.7
Mn-54	2.9	0.3

Decision threshold (α=0.05)

Comparison after - before cleaning

Difference: after - before

Radionuclide	Massic activity (mBq/kg)	uc	Relative difference (%)
Co-60	-0.50	1.7	-0.38
K-40	-7.3	1.3	-85
Th-228	1.9	0.9	29
Mn-54	1.0	0.4	54

Pogo Pins

- Better than 1st try with $CuBe_2$??
- This time without $CuBe_2$
- Sample mass 19 g
- Material : brass with a steel (?) spring inside
- Measured for 34 days of Ge-4

Sample cleaning at MPI München

- Performed in cleanroom
- Utrasonic bath with acetone for 15 min.
- Rinsing in isopropanol
- Drying oven at 70 °C over the weekend
- Shipment in Ar-atmosphere

Results: Pogo pins

Radionuclide	Massic activity (mBq/kg)	"Old results"		Comment
Pb-210:	1420 ± 100			
Ra-226:	58 ± 15	**Ra-226:**	**110**	(skipping first 11 days)
Ra-228:	22 ± 5			
Th-228:	40 ± 10	**Th-228:**	**44**	(the 2614 line still gives 70 though)
K-40:	380 ± 30	**K-40:**	**470**	